

CLAIMS

- 1) A fluid cooling system, for use in dispensing or distributing a chilled or cooled fluid, comprising a primary heat exchanger system, a secondary heat exchanger system, a first conduit through which fluid to be cooled or chilled is circulated, and a heat transfer agent for transferring cooling energy to the fluid to be chilled circulating in the first conduit, wherein the primary and secondary heat exchanger systems are arranged at least partially one inside of another.
- 2) A fluid cooling system according to claim 1, wherein the primary and secondary heat exchanger systems are arranged substantially one inside of another.
- 3) A fluid cooling system according to claim 1, wherein the primary heat exchanger system is arranged at least partially within the secondary heat exchanger system.
- 4) A fluid cooling system according to claim 1, wherein the primary heat exchanger system is arranged substantially within the secondary heat exchanger system.
- 5) A fluid cooling system according to claim 1, wherein the primary heat exchanger system comprises a chamber.
- 6) A fluid cooling system according to claim 1, wherein the secondary heat exchanger system comprises a chamber.
- 7) A fluid cooling system according to claim 1, wherein the chamber of the primary heat exchanger system is located substantially within the chamber of the secondary heat exchanger system.
- 8) A fluid cooling system according to claim 9, wherein the chamber of the primary heat exchanger system has an outlet for the heat transfer agent which communicates with the chamber of the secondary heat exchanger system.
- 9) A fluid cooling system according to claim 10 wherein the outlet of the chamber of the primary heat exchanger system is located in a wall of said chamber that is in contact with the chamber of the secondary heat exchanger system.
- 10) A fluid cooling system according to claim 1, wherein the primary heat exchanger system () also comprises a coil that effects cooling thermal exchange with the heat transfer agent in the chamber of said primary heat exchanger system.
- 11) A fluid cooling system according to claim 1, wherein the primary heat exchanger system also comprises a thermostat.

12)A fluid cooling system according to claim 1, wherein the heat transfer agent circulates from the primary heat exchanger system to the secondary heat exchanger system via the outlet in a wall of the chamber of the primary heat exchanger system.

13)A fluid cooling system according to claim 1, wherein the first conduit carrying the fluid to be cooled is located within the chamber of the secondary heat exchanger system.

14)A fluid cooling system according to claim 1, wherein the first conduit carrying the fluid to be cooled is arranged as a coil around a peripheral wall of the chamber of the primary heat exchanger system.

15)A fluid cooling system according to claim 1, wherein cooled heat transfer agent exiting via the outlet into the chamber of the secondary heat exchanger system flows into said chamber at one end of said chamber, over a peripheral surface of the first conduit, and out via an outlet in a wall of the chamber at another end of the chamber of the secondary heat exchange system.

16)A fluid cooling system according to claim 1, wherein the fluid cooling system also comprises a reservoir for the heat transfer agent, located adjacent to the chamber of the secondary heat exchanger system.

17)A fluid cooling system according to claim 16, wherein the reservoir is located above the chamber of the secondary heat exchanger system.

18)A fluid cooling system according to any one of claims 16 or 17, wherein the reservoir comprises a plug comprising an excess pressure-venting membrane.

19)A fluid cooling system according to claim 16, wherein the reservoir is connected to the outlet of the chamber of the secondary heat exchanger system via a pump.

20)A fluid cooling system according to any one of the preceding claims wherein the secondary heat exchanger system also comprises a pump for circulating heat transfer agent.

21)A fluid cooling system according to claim 1, wherein the primary heat exchanger system is arranged at least partially around the secondary heat exchanger system.

22)A fluid cooling system according to claim 1, wherein the primary heat exchanger system is arranged substantially around the secondary heat exchanger system.

- 23)A fluid cooling system according to claim 1, wherein the primary heat exchanger system comprises a second conduit that extends with and around the first conduit of the secondary heat exchanger, for at least part of the length of said first conduit.
- 24)A fluid cooling system according to claim 23, wherein the second conduit carries the heat exchange agent originating from the primary heat exchanger.
- 25)A fluid cooling system according to claim 23, wherein the second conduit of the primary heat exchanger is arranged around and along the length the first conduit of the secondary heat exchanger in such a way that sufficient cooling energy is imparted by the heat exchange agent to cool the fluid circulating within conduit.
- 26)A fluid cooling system according to claim 23, wherein the primary heat exchanger system comprises a separate coil and chamber for transferring cooling energy to the heat transfer agent, distant from the second conduit.
- 27)A fluid cooling system according to claim 26, wherein the primary heat exchanger also comprises a thermostat for regulating the temperature of the the heat transfer agent, and hence the liquid to be cooled.
- 28)A fluid cooling system according to any one of claims 23 to 27, wherein the primary heat exchanger system also comprises a pump connected to the chamber of the primary heat exchanger system.
- 29)A fluid cooling system according to any one of claims 23 to 28, wherein the chamber of the primary heat exchanger system is connected to the second conduit via an outlet leading from said chamber to said second conduit.
- 30)A fluid cooling system according to any one of claims 23 to 29, wherein the second conduit of the primary heat exchanger system extends coaxially along substantially the whole of the length of the first conduit of the secondary heat exchanger system.
- 31)A fluid cooling system according to any one of claims 23 to 30, wherein the second conduit of the primary heat exchanger system is coiled around the periphery of the first conduit of the secondary heat exchanger system.
- 32)A fluid cooling system according to any one of claims 23 to 31, wherein the second conduit is arranged around the first conduit in one or more sections, such that heat transfer would occur from conduit to conduit at one or more non-contiguous regions or zones along the length of conduit, but in a manner sufficient to effect desired cooling of the fluid within conduit.

33)A fluid cooling system according to claim 23, wherein the primary heat exchanger system also comprises a heat transfer agent recovery tank.

34)A fluid cooling system according to any one of claims 23 to 33, wherein the heat transfer agent recovery tank is connected to the pump.

5 35)A fluid cooling system according to any one of claims 23 to 34, wherein the second conduit is also connected to the heat transfer agent recovery tank.

36)A fluid cooling system according to claim 35, wherein the system also comprises a switch connected to said second conduit to effect recovery of the heat transfer agent into the recovery tank.

0 37)A fluid cooling system according to claim 1, wherein the fluid to be cooled is a liquid.

38)A fluid cooling system according to claim 1, wherein the fluid is a liquid and comprises non-alcoholic beverages, such as fruit juice, water, drinking water, and alcoholic beverages, such as beer, wine, and spirit liquors.

39)A fluid cooling system according to claim 1, wherein the fluid to be cooled is a gas.

5 40)A fluid cooling system according to claim 1, wherein the fluid is a gas and comprises air, oxygen, nitrogen, helium, hydrogen, nitrous oxide.

41)A fluid cooling system according to claim 1, wherein the first conduit is sterilized periodically.

10 42)A cooled fluid dispenser comprising a source of fluid to be cooled and dispensed, and at least one dispenser tap, wherein the dispenser incorporates a fluid cooling system according to any one of claims 1 to 41.

43)A cooled fluid dispenser according to claim 42, wherein the dispenser further comprises another dispensing tap connected to the source of fluid independently from said fluid cooling system.

15 44)A cooled fluid dispenser according to claim 42, wherein the source of fluid to be cooled and dispensed is removable.

45)A cooled fluid dispenser according to claim 42, wherein the removable source of fluid is selected from the group consisting of a pressurized or non-pressurized bottle, canister, and tank.

20 46)Method for the sterilization of a cooled fluid dispenser, comprising the following steps

:

- draining a chamber carrying a heat transfer agent in a primary heat exchanger system ;
- optionally draining a first conduit carrying fluid to be cooled and dispensed ;
- sterilizing the first conduit for a length of time sufficient to cause bacteriological destruction and sterilization.

47)Method for the sterilization of a cooled fluid dispenser, comprising the following steps :

- draining a second conduit carrying a heat transfer agent in a primary heat exchanger system ;
- optionally draining a first conduit carrying fluid to be cooled and dispensed ;
- sterilizing the first conduit for a length of time sufficient to cause bacteriological destruction and sterilization.

48)Method according to claim 46 or claim 47, wherein the sterilization step comprises flushing the first conduit with a sterilizing agent.

49)Method according to claim 48, wherein the sterilizing agent is a solution of sulfamic acid.

50)Method according to claim 46 or claim 47, wherein the sterilization step comprises heating the first conduit to a temperature that is maintained for a time sufficient to cause bacteriological destruction and sterilization.

51)Method according to claim 50, wherein heating of the first conduit is effected by application of an electric current to parts of said first conduit, or of the fluid cooling system.

52)Method according to any one of claims 50 or 51, wherein the heating causes any remaining fluid in the first conduit or fluid cooling system to reach sterilization temperature and travel along said conduit, thereby effecting sterilization of said conduit.

53)Method according to any one of claims 46 to 52, wherein the dispensing taps are also sterilized.

54)Method according to any one of claims 46 to 53, wherein a fluid source perforator connectable to a fluid source to be cooled and dispensed is also sterilized.